ML
Traffic Engineers

TRAFFIC AND PARKING IMPACT ASSESSMENT

Proposed Increase of Patronage Of A Showroom and Tasting Area

45 Mitchell Road in Brookvale

Prepared for: Dad & Dave's Brewing

A221756N (version 1a)

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Contents

1. INTRODUCTION

ML Traffic Engineers was commissioned by Dad & Dave's Brewing to prepare a traffic and parking impact assessment for a proposed increase of patron's number of a showroom and tasting area in 45 Mitchel Road in Brookvale. Currently, Showroom and tasting area trades as Dad & Dave's Brewing

The proposed increase of patron number is from 100 to 140 with the outdoor car-park being used as a tasting area during the during tasting/cellar door hours..

Vehicle access and egress is via Mitchel Road.

This traffic report focuses on the proposed increase of patron number and changes in car usage and car park utilisation and additional trips from the proposed application.

In the course of preparing this assessment, the subject site and its environs have been inspected, plans of the development examined, and all relevant traffic and parking data collected and analysed.

The Scope of Works is as follows for preparing a traffic and parking impact based on qualitative assessment:

- Assess the traffic impacts usage of the proposed alteration on the local road network upon the external road network including nearby intersections
- Assess the parking demand and the parking requirements of the proposed alteration
- Provide a parking certification for the car area (all infrastructure are existing) according to Australian Standards

2. BACKGROUND AND EXISTING CONDITIONS

2.1 Location and Land Use

The existing development is located in the industrial area of Brookvale with Freshwater Senior Campus on the east. Residential buildings are primarily located at least 200 metres away to the south. Denzil Joyce Oval is located west of the proposed development. This site is located within a *General Residential, IN1*

Figures 1 and 2 shows the location of the existing showroom and tasting area from the aerial and street map perspective respectively.

Figures 3 shows the existing development site.

Figure 1: Location of the Subject Site on Aerial

Figure 2: Street Map of the Location of the existing showroom and tasting area

Figure 3: Photograph of the Existing showroom and tasting area from Mitchell Road

2.2 Road Network

Orchard Road is a local road with one lane each way with a speed limit of 50km/hr. Unrestricted Parking is permitted on both side of the road.

Mitchell Road is a local road with one lane each way with a sign posted speed limit of 50km/hr. Unrestricted Parking is permitted on both side of the road. Figure 4a and 4b show photographs of Mitchell Road.

Wattle Road is a local road with one lane each way with a speed limit of 50km/hr. 2 hour restricted on street parking is permitted on the north side of intersection between Wattle Road and Mitchell Road.

Figure 4a: Mitchell Road looking north from the site

Figure 4b: Mitchell Road looking south from the site

2.3 Intersection Description

As part of this traffic impact assessment two intersections are assessed:

- Roundabout intersection of Mitchell Road with Orchard Road
- Priority intersection of Mitchell Road with Wattle Road

External travel to and from the proposed Showroom and tasting area are most likely to travel through one of the above intersections. The intersections are assessed for the weekday PM hour (5pm to 6pm) and Saturday PM peak hour (6pm to 7pm) when the proposed Showroom and tasting area is at its busiest on the weekday and on a weekend.

The roundabout intersection of Mitchell Road with Orchard Road is a four-leg intersection with all turn movements permitted. The roundabout has one circulating lane. figure 6a and 6b present photographs of the intersection on Aerial and the layout of this intersection using SIDRA (9), respectively. SIDRA is an industry standard intersection software.

The priority intersection of Mitchell Road with Wattle Road is a three-legged intersection with all turn movements. Traffic on Mitchell Road must give way to traffic on Wattle Road. Figure 6c and 6d present photographs of the intersection on Aerial and the layout of this intersection using SIDRA (9), respectively. SIDRA is an industry standard intersection software.

Figure 5: Roundabout Intersection Layout of Mitchell Road with Orchard Road (SIDRA)

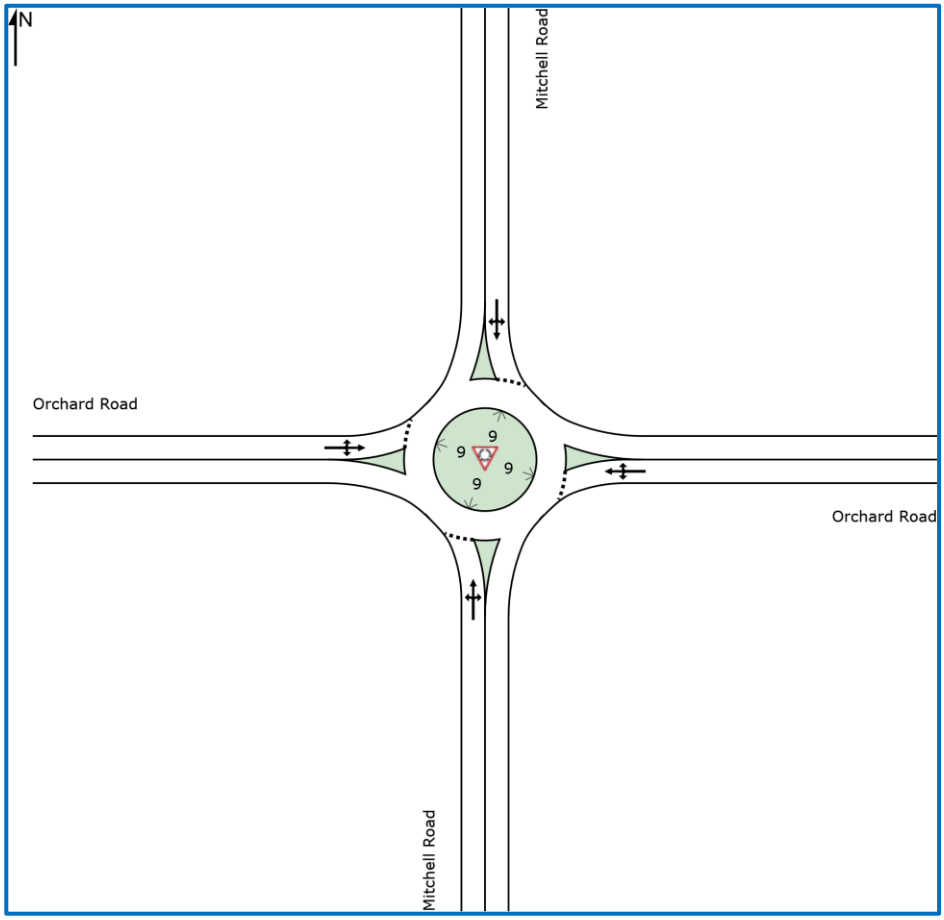

Figure 5: Roundabout Intersection Layout of Mitchell Road with Orchard Road (SIDRA)

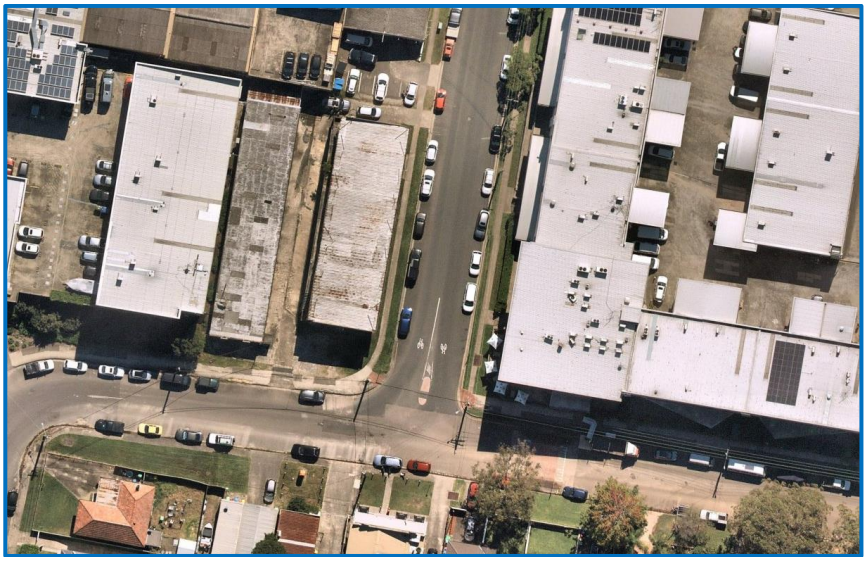

Figure 6: Priority Intersection Layout of Mitchell Road with Wattle Road (SIDRA)

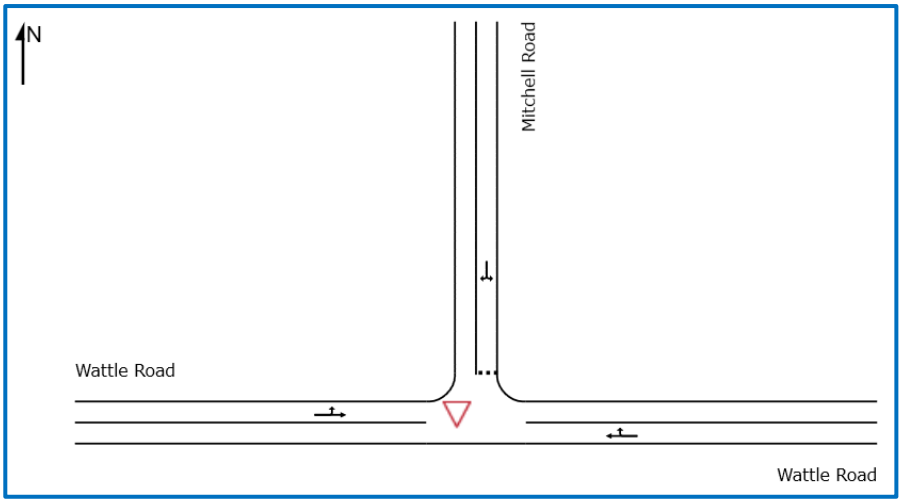

Figure 6: Priority Intersection Layout of Mitchell Road with Wattle Road (SIDRA)

2.4 Traffic Volumes

As part of the traffic assessment, traffic counts have been undertaken at the adjacent intersections for the weekday and Saturday PM peak period. The PM peak hour were 6 PM to 7 PM for Saturday.

The traffic volumes are presented in the following Figures in vehicle numbers.

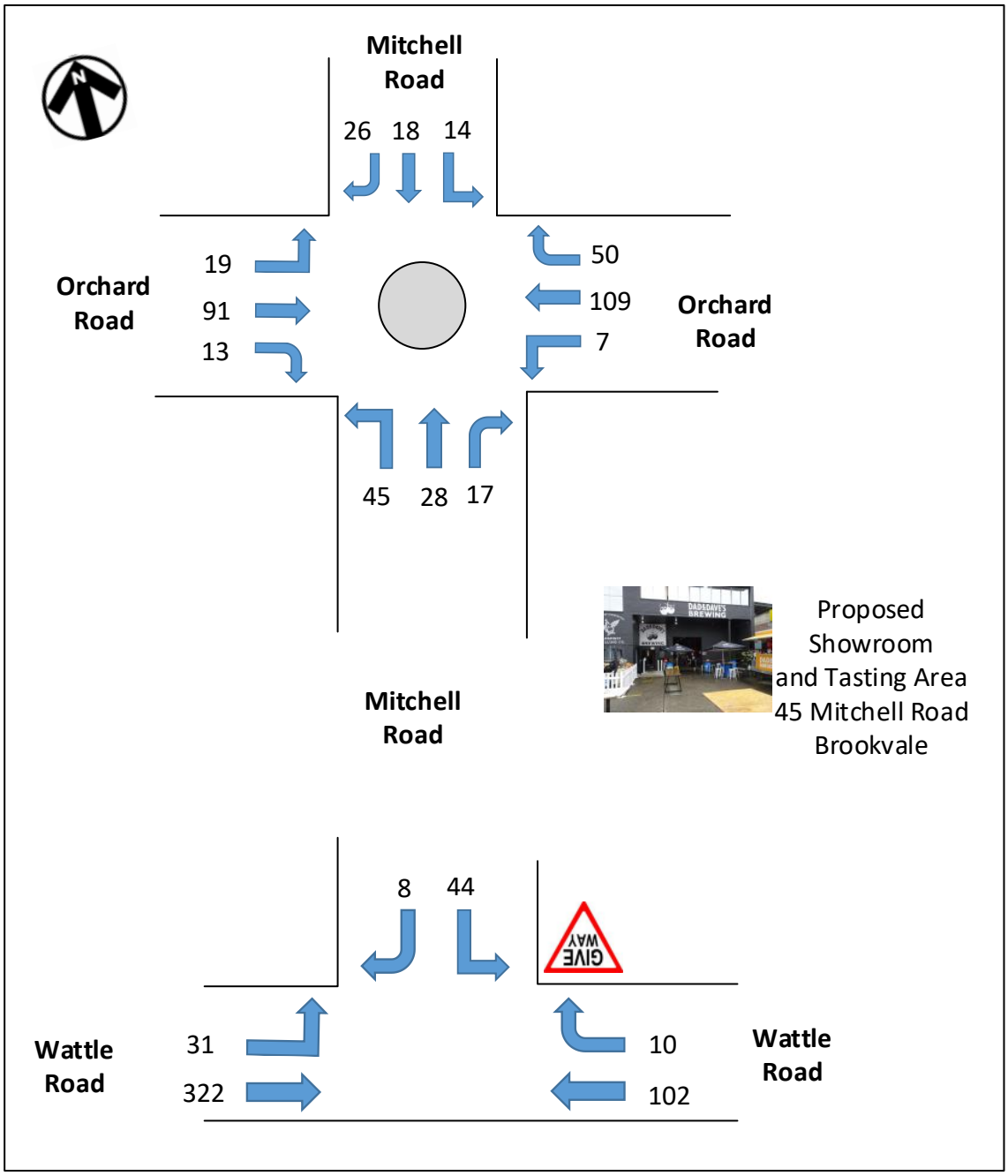

Figure 7: Existing Weekday PM Peak Hour Traffic Volumes

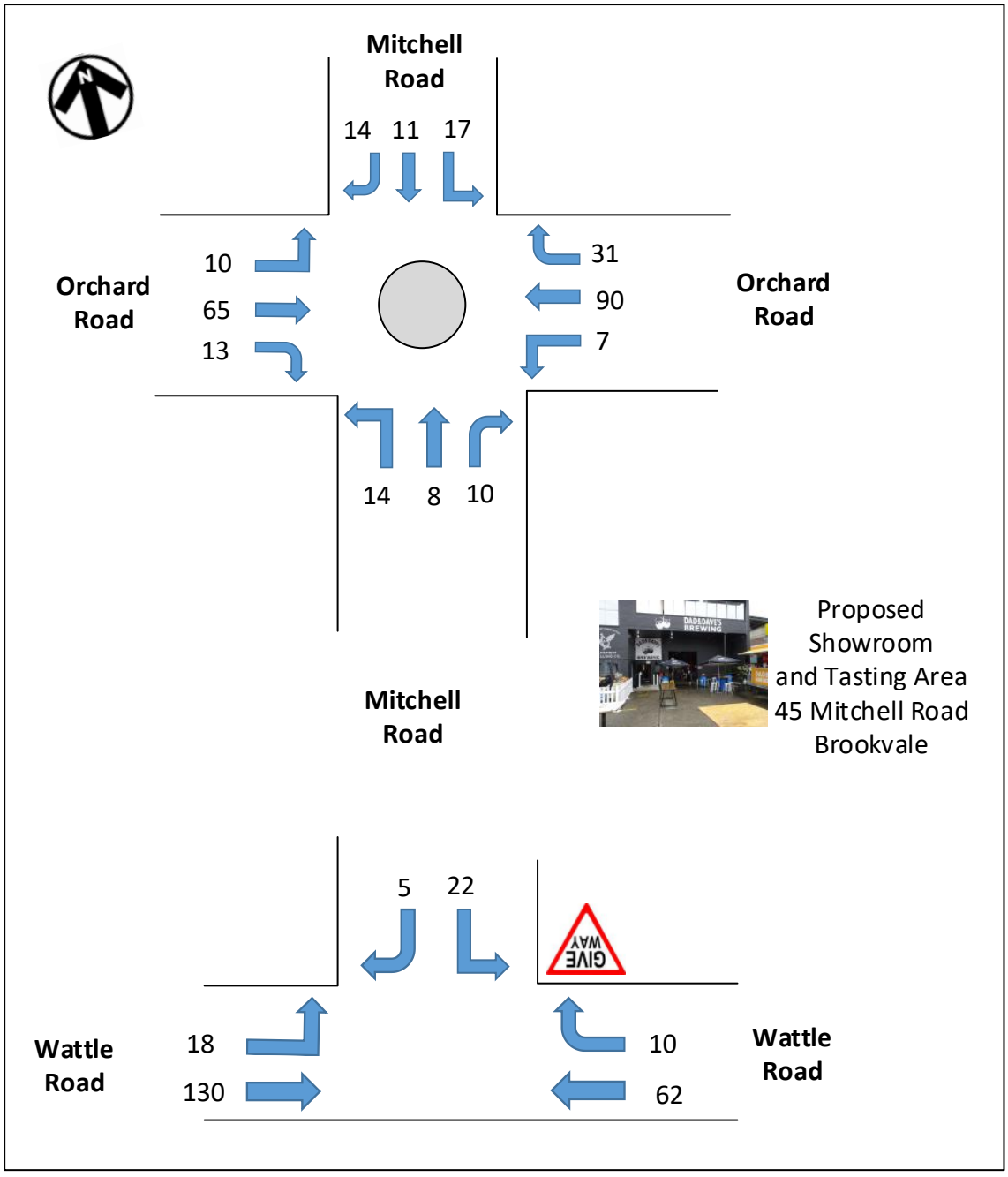

Figure 8: Existing Saturday PM Peak Hour Traffic Volumes

2.5 Intersection Assessment

This section assesses the two surveyed intersections.

The existing intersection operating performance was assessed using the SIDRA software package (version 6) to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection. The SIDRA program provides Level of Service Criteria Tables for various intersection types. The key indicator of intersection performance is Level of Service, where results are placed on a continuum from 'A' to 'F', as shown in Table 1.

LoS	**Traffic Signal / Roundabout**	**Give Way / Stop Sign / T-Junction control**
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

Table 1: Intersection Level of Service

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for level of service assessment should be that movement with the highest average delay.

LoS	Average Delay per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

Table 2: Intersection Average Delay (AVD)

The degree of saturation (DS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep DS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent satisfactory intersection operation. When DS exceed 0.9 queues can be anticipated.

Roundabout intersection of Mitchell Road with Orchard Road

- The overall intersection has a LoS A for the PM peak hours on the weekday and Saturday
- There is spare capacity at this intersection

Priority intersection of Mitchell Road with Wattle Road

- All turn movements have a LoS A or B for the PM peak hour on weekday and Saturday
- There is spare capacity at this intersection

The full Sidra results are presented in Appendix A.

2.6 Public Transport

The nearest bus stop to the proposed showroom and tasting area is 400 metres away on Pittwater Road. This stop is serviced by Bus Route 193. This public transport service provides access to a range of suburbs including Austlink, Warringah Mall, Frenchs Forest, Belrose, Narraweena, and Beacon Hills.

The proposed development has access to public bus services.

Figure 9 shows the proximity of the site to public transport services

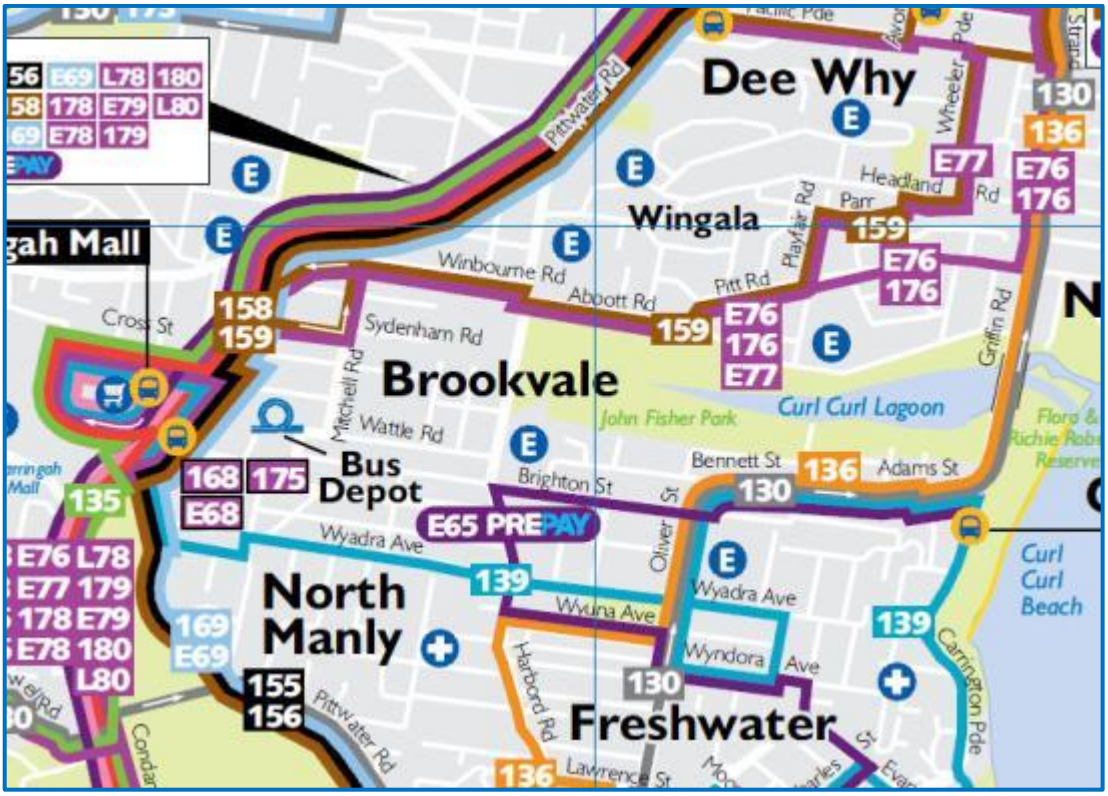

Figure 9: Nearby Public Bus Services

2.7 Public Parking

On street parking is permitted on Mitchell Road and Orchard Road and surrounding roads near the site. A parking survey was undertaken on the weekday and Saturday in December 2019. The extent of the parking survey is shown in Figure 10.

The results of the parking survey are presented in Tables 3 and 4 for the weekday and Saturday respectively. The Saturday has a moderate number of vacant car spaces available during the business hours (between 10am to 5pm). There is a larger number of vacant car spaces after 5pm for both weekdays and on the weekend.

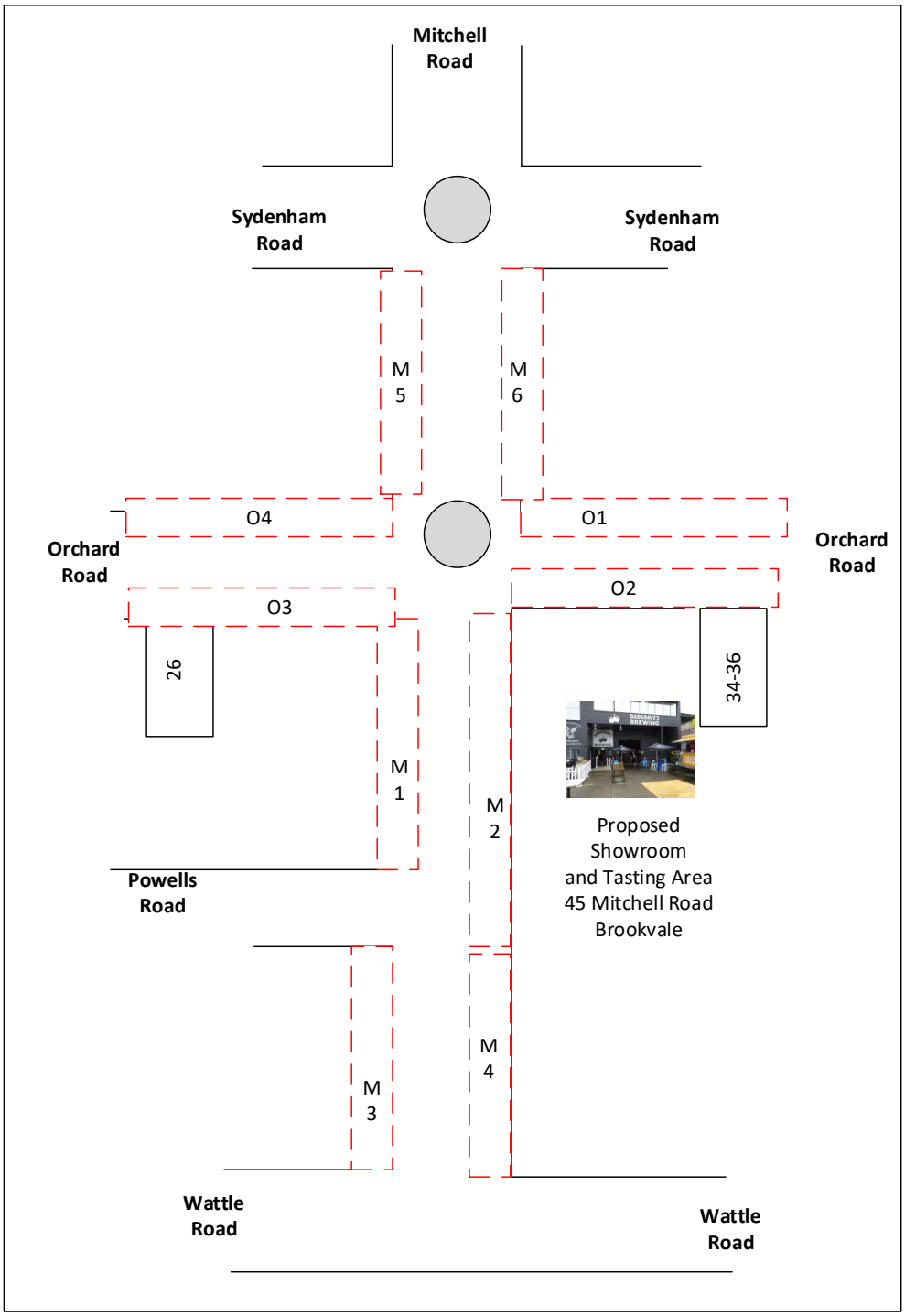

Figure 10: Public Parking Survey Area

		weekday					
Area	Car Spaces	4pm	5pm	6pm	7pm	8pm	10pm
M1	12	10	8	5	3	2	2
M2	8	7	5	3	4	2	2
M3	12	10	9	4	3	3	3
M4	14	12	11	6	4	2	3
M5	12	11	8	6	5	3	1
M6	7	7	7	6	5	2	2
O1	6	6	6	4	2	1	1
O2	8	7	6	5	4	2	1
O3	8	7	8	4	4	4	3
O4	6	6	6	3	2	1	0
Total	93	83	74	46	36	22	18
Vacant car spaces		10	19	47	57	71	75

Table 3: Results of the Parking Survey on a Weekday

		Saturday									
Area	Car Spaces	10am	11am	midday	1pm	2pm	4pm	6pm	7pm	8pm	10pm
M1	12	10	11	11	10	8	5	4	2	2	2
M2	8	6	6	8	6	6	3	1	1	1	1
M3	12	8	10	11	10	11	5	2	1	1	1
M4	14	11	12	11	10	11	4	3	2	0	0
M5	12	10	11	12	11	8	6	5	4	4	2
M6	7	6	7	7	7	5	2	2	2	0	0
O1	6	5	6	6	6	6	2	2	2	2	1
O2	8	6	7	7	6	5	3	2	1	2	2
O3	8	8	8	8	7	7	3	4	2	2	3
O4	6	6	6	6	5	5	4	4	4	4	3
Total	93	76	84	87	78	72	37	29	21	18	15
Vacant car spaces		17	9	6	15	21	56	64	72	75	78

Table 4: Results of the Parking Survey on a Saturday

2.8 Conclusions

The two surveyed intersections have sufficient spare capacity to accommodate additional traffic.

The carpark survey conducted show that there are at least ten and six vacant car spaces during the weekday and Saturday peak hours respectively

There are vacant public car spaces nearby on a weekday and a Saturday and on surrounding streets.

The site has access to public transport.

3. PROPOSED INCREASE IN PATRONAGE

Details of the proposed increase of patronage of the showroom and tasting area are as follows

- Increase the maximum capacity number of patrons from 100 patrons to 140 patrons
- Utilise the outdoor car-park as tasting area during the tasting/cellar door hours

3.1 Outdoor Area

- The total GFA of the outdoor car-park area is 159 m^2

3.2 Operation details

The details of operation are as follows:

- The outdoor area will only be used during tasting/cellar door hours
- Patrons will rely on public on-street parking
- Staff will rely on off-street parking on properties access by Dad & Dave's Brewing at 31/9 Powells Road and 2/10 Chard Road (walking distance from the development)

3.3 Parking

The parking area as discussed before will be used tasting/cellar door hours. Patrons will rely on public on street parking and staff will rely on off-street parking

4. PARKING REQUIREMENT

The requirements for car parking for a general club are presented in Warringah Council's Development Control Plan (2011)

The parking requirements are as follows as it applies to this development is as follows:

Shop (showroom and tasting area)

- 6.1 car space per GFA 100m^2

The floor space to be used for tasting area and showroom is approximately 159 m^2. Based on the above then the car space requirement is tabulated as follows:

Use	Area (m²)	Car Parking Rate	Car Spaces Required	Car Spaces Provided
Retail (showroom and tasting area)	159	6.1 per 100m²	10	0

Table 5: Parking Requirement and Provision

The proposed development is ten car space short of meeting Council's car parking requirements.

The public parking survey (see Section 2.7) on the nearby streets (Mitchell Road and Orchard Road) showed that there is minimum 56 vacant car spaces on Saturday after 4 PM(the time when the outdoor area will start to operate) and 32 vacant car spaces on weekdays after 4 PM. These car spaces can be used by patrons. This arrangement is considered acceptable

5. TRAFFIC GENERATION AND IMPACT

5.1 Traffic Generation

The RTA *Guide to Traffic Generating Developments Version 2.2* publishes trip rates for showroom and tasting areas as follows for the evening peak hour:

Specialised Retail (showroom and tasting area)

- 5.6 car trip per 100m^2 GFA for weekdays PM peak hour
- 10.2 trips per 100m^2 GFA for Saturday PM peak hour

It is assumed that the staff arrive outside of the peak hours.

Table 6 shows the trip generation for the proposed showroom and tasting areas. The site is a modest trip generator.

	Peak Hour	Use	Area (m²)	Trip Generation Rate per 100m²	Trips Generated
Weekday	PM	Showroom and tasting area	159	5.6	9
Saturday				10.2	16

Table 6: Trip Generation for the Proposed Showroom and Tasting Area for the Weekday Peak Hours

5.2 Trip distribution

The predicted trips are distributed to the road network assuming 90 percent outbound trips 10 percent inbound trips for the Weekday peak hour and 0 percent outbound trips 10 percent inbound trips for the weekends peak hour, which results the following:

	Peak Hour	Origin	Destination	Total Trips
Weekday	PM	1	8	9
Saturday		2	14	16

Table 7: Trip Distribution for the Proposed Showroom and Tasting Area

5.3 Existing with Additional Showroom and Tasting Area Traffic

The additional development trips are assigned onto the local traffic network. The following figures present the future traffic volume with the development trips (in red for origin trips and blue for destination trips) for the weekday AM and PM peak hours.

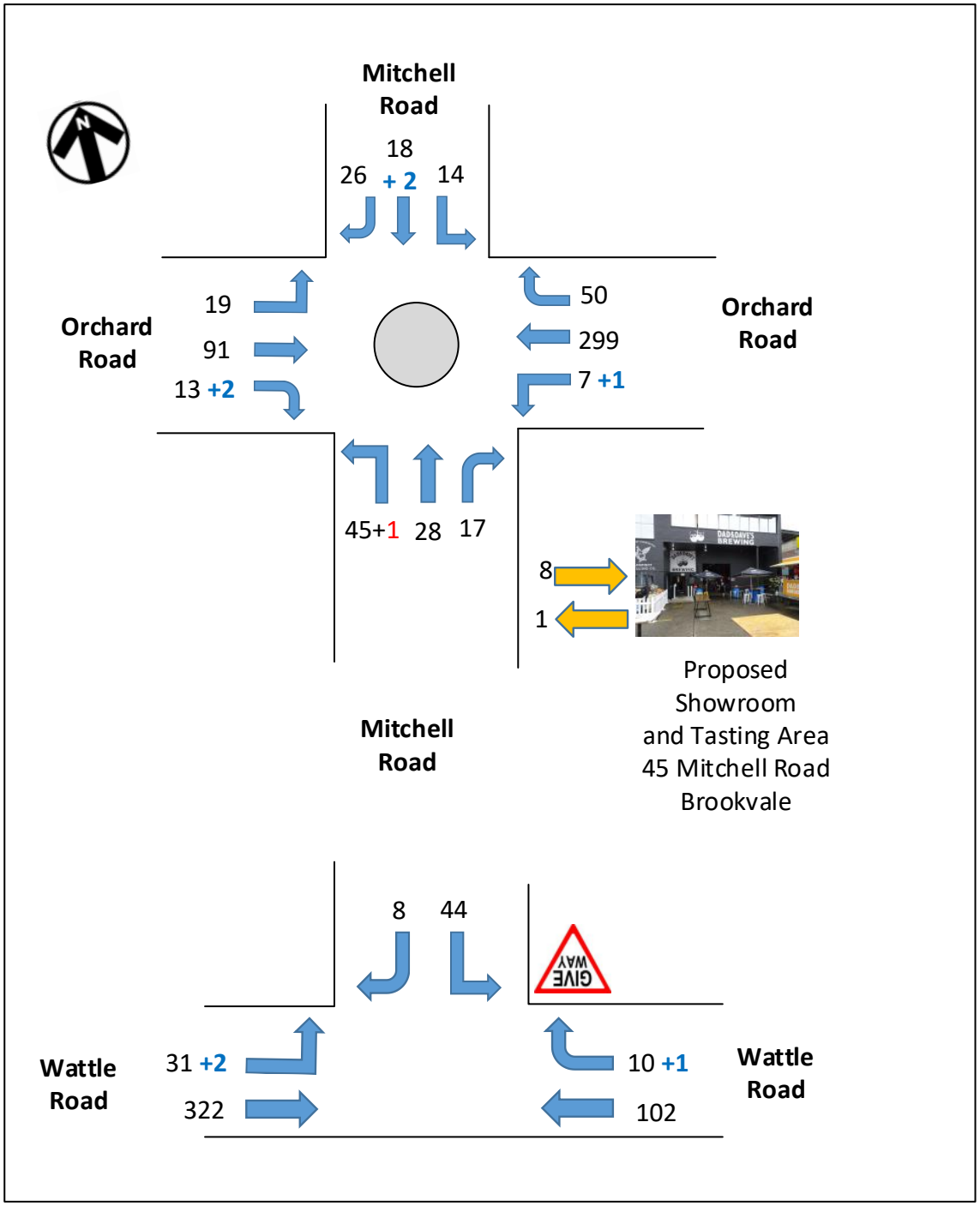

Figure 11: Weekday PM Peak Hour Car Trip Distribution (Development origin trips in red and destination trips in blue)

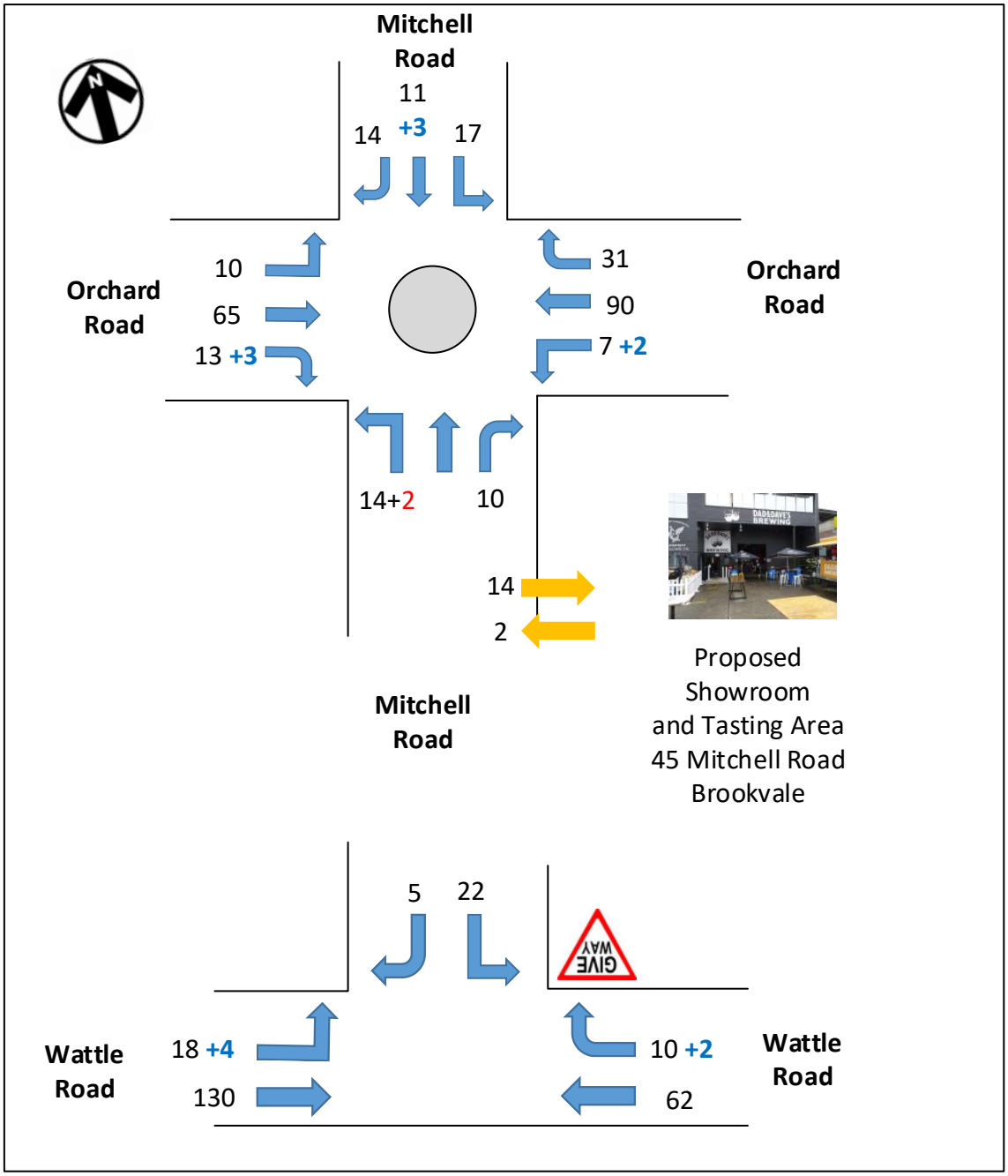

Figure 12: Saturday Peak Hour Car Trip Distribution (Development origin trips in red and destination trips in blue)

The trip distribution onto the local road and intersections shows a small increase in trip numbers and represents a low percentage of the estimated capacity of the intersections concerned. For most drivers the increase in trips will not be noticeable.

5.4. Traffic Impact

An intersection with the additional trips for the weekday PM and Saturday peak hours has been undertaken for the four surveyed intersections

.

The results of the intersection analysis are as presented below:

Roundabout intersection of Mitchell Road with Orchard Road

- The overall intersection has a LoS A for the PM peak hours on the weekday and Saturday
- The additional trips do not change the LoS of the intersection

Priority intersection of Mitchell Road with Wattle Road

- All turn movements have a LoS A or B for the PM peak hour on weekday and Saturday
- The additional trips do not change the LoS for any turn movement

6. CONCLUSIONS

The traffic and parking assessment of the proposed showroom and tasting area development showed the following:

Car Parking

- The proposed increase of patron's number of a showroom and tasting area is deficit of 10 car spaces short of meeting Council's car parking requirements, however the parking survey shows that there are sufficient vacant car spaces nearby to accommodate the additional car space for the showroom and tasting area customers
- Staff will use off-street parking on nearby properties at 31/9 Powells Road and 2/10 Chard Road which has access by Dad & Dave's Brewing
- Hours of operation of the tasting area is limited so that it operates outside of times of peak demand for on-street car parking

Traffic

- The proposed development is a modest net trip generator
- The expected trips from the proposed showroom and tasting area during the weekday PM and Saturday peak hours are modest and can be accommodated within the local road network and intersections.
- There are no traffic engineering reasons why a development consent for the proposed showroom and tasting area development at 45 Mitchell Road in Brookvale should be refused.

APPENDIX A
INTERSECTION ASSESSMENT FOR EXISTING TRAFFIC

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Mitchell Road												
1	L2	47	0.0	0.107	6.3	LOS A	0.6	3.9	0.53	0.64	0.53	45.2
2	T1	29	0.0	0.107	5.9	LOS A	0.6	3.9	0.53	0.64	0.53	45.7
3	R2	18	0.0	0.107	9.0	LOS A	0.6	3.9	0.53	0.64	0.53	45.5
Approach		95	0.0	0.107	6.7	LOS A	0.6	3.9	0.53	0.64	0.53	45.4
East: Orchard Road												
4	L2	7	0.0	0.282	4.3	LOS A	1.7	12.2	0.23	0.47	0.23	46.1
5	T1	315	0.0	0.282	4.0	LOS A	1.7	12.2	0.23	0.47	0.23	46.7
6	R2	53	0.0	0.282	7.0	LOS A	1.7	12.2	0.23	0.47	0.23	46.5
Approach		375	0.0	0.282	4.4	LOS A	1.7	12.2	0.23	0.47	0.23	46.7
North: Mitchell Road												
7	L2	15	0.0	0.055	4.6	LOS A	0.3	1.9	0.29	0.55	0.29	45.5
8	T1	19	0.0	0.055	4.3	LOS A	0.3	1.9	0.29	0.55	0.29	46.1
9	R2	27	0.0	0.055	7.3	LOS A	0.3	1.9	0.29	0.55	0.29	45.9
Approach		61	0.0	0.055	5.7	LOS A	0.3	1.9	0.29	0.55	0.29	45.8
West: Orchard Road												
10	L2	20	0.0	0.113	4.5	LOS A	0.6	4.1	0.27	0.48	0.27	46.0
11	T1	96	0.0	0.113	4.2	LOS A	0.6	4.1	0.27	0.48	0.27	46.6
12	R2	14	0.0	0.113	7.2	LOS A	0.6	4.1	0.27	0.48	0.27	46.5
Approach		129	0.0	0.113	4.6	LOS A	0.6	4.1	0.27	0.48	0.27	46.5
All Vehicles		660	0.0	0.282	4.9	LOS A	1.7	12.2	0.29	0.50	0.29	46.4

Table A1: Weekday Roundabout Intersection Performance of Mitchell Road with Orchard Road PM Peak Hour

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Wattle Road												
5	T1	107	0.0	0.064	0.2	LOS A	0.1	0.6	0.10	0.05	0.10	49.4
6	R2	11	0.0	0.064	5.9	LOS A	0.1	0.6	0.10	0.05	0.10	48.5
Approach		118	0.0	0.064	0.7	NA	0.1	0.6	0.10	0.05	0.10	49.4
North: Mitchell Road												
7	L2	46	0.0	0.049	5.7	LOS A	0.2	1.3	0.39	0.59	0.39	45.7
9	R2	8	0.0	0.049	6.6	LOS A	0.2	1.3	0.39	0.59	0.39	45.3
Approach		55	0.0	0.049	5.8	LOS A	0.2	1.3	0.39	0.59	0.39	45.7
West: Wattle Road												
10	L2	33	0.0	0.191	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.2
11	T1	339	0.0	0.191	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.7
Approach		372	0.0	0.191	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.7
All Vehicles		544	0.0	0.191	1.0	NA	0.2	1.3	0.06	0.10	0.06	49.2

Table A2: Weekday Priority Intersection Performance of Mitchell Road with Wattle Road PM Peak Hour

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Mitchell Road												
1	L2	15	0.0	0.031	4.7	LOS A	0.1	1.0	0.30	0.53	0.30	45.7
2	T1	8	0.0	0.031	4.3	LOS A	0.1	1.0	0.30	0.53	0.30	46.2
3	R2	11	0.0	0.031	7.4	LOS A	0.1	1.0	0.30	0.53	0.30	46.1
Approach		34	0.0	0.031	5.4	LOS A	0.1	1.0	0.30	0.53	0.30	45.9
East: Orchard Road												
4	L2	7	0.0	0.104	4.2	LOS A	0.5	3.7	0.15	0.48	0.15	46.1
5	T1	95	0.0	0.104	3.8	LOS A	0.5	3.7	0.15	0.48	0.15	46.7
6	R2	33	0.0	0.104	6.9	LOS A	0.5	3.7	0.15	0.48	0.15	46.5
Approach		135	0.0	0.104	4.6	LOS A	0.5	3.7	0.15	0.48	0.15	46.7
North: Mitchell Road												
7	L2	18	0.0	0.038	4.4	LOS A	0.2	1.3	0.24	0.52	0.24	45.8
8	T1	12	0.0	0.038	4.1	LOS A	0.2	1.3	0.24	0.52	0.24	46.3
9	R2	15	0.0	0.038	7.1	LOS A	0.2	1.3	0.24	0.52	0.24	46.1
Approach		44	0.0	0.038	5.2	LOS A	0.2	1.3	0.24	0.52	0.24	46.0
West: Orchard Road												
10	L2	11	0.0	0.075	4.2	LOS A	0.4	2.5	0.18	0.47	0.18	46.2
11	T1	68	0.0	0.075	3.9	LOS A	0.4	2.5	0.18	0.47	0.18	46.8
12	R2	14	0.0	0.075	6.9	LOS A	0.4	2.5	0.18	0.47	0.18	46.6
Approach		93	0.0	0.075	4.4	LOS A	0.4	2.5	0.18	0.47	0.18	46.7
All Vehicles		305	0.0	0.104	4.7	LOS A	0.5	3.7	0.19	0.49	0.19	46.5

Table A3: Saturday Roundabout Intersection Performance of Mitchell Road with Orchard Road PM Peak Hour

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Wattle Road												
5	T1	65	0.0	0.040	0.1	LOS A	0.1	0.5	0.08	0.08	0.08	49.3
6	R2	11	0.0	0.040	5.0	LOS A	0.1	0.5	0.08	0.08	0.08	48.4
Approach		76	0.0	0.040	0.8	NA	0.1	0.5	0.08	0.08	0.08	49.2
North: Mitchell Road												
7	L2	23	0.0	0.021	4.9	LOS A	0.1	0.5	0.23	0.51	0.23	46.1
9	R2	5	0.0	0.021	5.3	LOS A	0.1	0.5	0.23	0.51	0.23	45.7
Approach		28	0.0	0.021	5.0	LOS A	0.1	0.5	0.23	0.51	0.23	46.0
West: Wattle Road												
10	L2	19	0.0	0.080	4.6	LOS A	0.0	0.0	0.00	0.07	0.00	49.1
11	T1	137	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	49.6
Approach		156	0.0	0.080	0.6	NA	0.0	0.0	0.00	0.07	0.00	49.6
All Vehicles		260	0.0	0.080	1.1	NA	0.1	0.5	0.05	0.12	0.05	49.0

Table A4: Saturday Priority Intersection Performance of Mitchell Road with Wattle Road PM Peak Hour

APPENDIX B

INTERSECTION ASSESSMENT FOR FUTURE CONDITION WITH SHOWROOM AND TASTING AREA TRIPS

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Mitchell Road												
1	L2	47	0.0	0.107	6.3	LOS A	0.6	3.9	0.53	0.64	0.53	45.2
2	T1	29	0.0	0.107	5.9	LOS A	0.6	3.9	0.53	0.64	0.53	45.7
3	R2	18	0.0	0.107	9.0	LOS A	0.6	3.9	0.53	0.64	0.53	45.5
Approach		95	0.0	0.107	6.7	LOS A	0.6	3.9	0.53	0.64	0.53	45.4
East: Orchard Road												
4	L2	8	0.0	0.285	4.3	LOS A	1.8	12.4	0.24	0.47	0.24	46.1
5	T1	315	0.0	0.285	4.0	LOS A	1.8	12.4	0.24	0.47	0.24	46.7
6	R2	53	0.0	0.285	7.0	LOS A	1.8	12.4	0.24	0.47	0.24	46.5
Approach		376	0.0	0.285	4.4	LOS A	1.8	12.4	0.24	0.47	0.24	46.6
North: Mitchell Road												
7	L2	15	0.0	0.057	4.7	LOS A	0.3	1.9	0.30	0.54	0.30	45.5
8	T1	21	0.0	0.057	4.3	LOS A	0.3	1.9	0.30	0.54	0.30	46.1
9	R2	27	0.0	0.057	7.3	LOS A	0.3	1.9	0.30	0.54	0.30	45.9
Approach		63	0.0	0.057	5.7	LOS A	0.3	1.9	0.30	0.54	0.30	45.9
West: Orchard Road												
10	L2	20	0.0	0.114	4.5	LOS A	0.6	4.1	0.27	0.48	0.27	46.0
11	T1	96	0.0	0.114	4.2	LOS A	0.6	4.1	0.27	0.48	0.27	46.6
12	R2	16	0.0	0.114	7.2	LOS A	0.6	4.1	0.27	0.48	0.27	46.4
Approach		132	0.0	0.114	4.6	LOS A	0.6	4.1	0.27	0.48	0.27	46.5
All Vehicles		665	0.0	0.285	4.9	LOS A	1.8	12.4	0.29	0.50	0.29	46.4

Table B1: Weekday Roundabout Intersection Performance of Mitchell Road with Orchard Road PM Peak Hour with Showroom and Tasting Area Trips

Movement Performance - Vehicles													
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Wattle Road												
5	T1	107	0.0	0.065	0.2	LOS A	0.1	0.7	0.11	0.06	0.11	49.4
6	R2	12	0.0	0.065	5.9	LOS A	0.1	0.7	0.11	0.06	0.11	48.4
Approach		119	0.0	0.065	0.8	NA	0.1	0.7	0.11	0.06	0.11	49.3
North: Mitchell Road												
7	L2	46	0.0	0.049	5.7	LOS A	0.2	1.3	0.39	0.59	0.39	45.7
9	R2	8	0.0	0.049	6.6	LOS A	0.2	1.3	0.39	0.59	0.39	45.3
Approach		55	0.0	0.049	5.8	LOS A	0.2	1.3	0.39	0.59	0.39	45.7
West: Wattle Road												
10	L2	35	0.0	0.193	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.2
11	T1	339	0.0	0.193	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.7
Approach		374	0.0	0.193	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.6
All Vehicles		547	0.0	0.193	1.1	NA	0.2	1.3	0.06	0.11	0.06	49.1

Table B2: Weekday Priority Intersection Performance of Mitchell Road with Wattle Road PM Peak Hour with Showroom and Tasting Area Trips

Movement Performance - Vehicles													
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Mitchell Road												
1	L2	15	0.0	0.031	4.7	LOS A	0.1	1.0	0.30	0.53	0.30	45.7
2	T1	8	0.0	0.031	4.3	LOS A	0.1	1.0	0.30	0.53	0.30	46.2
3	R2	11	0.0	0.031	7.4	LOS A	0.1	1.0	0.30	0.53	0.30	46.1
Approach		34	0.0	0.031	5.4	LOS A	0.1	1.0	0.30	0.53	0.30	45.9
East: Orchard Road												
4	L2	9	0.0	0.107	4.2	LOS A	0.5	3.8	0.17	0.48	0.17	46.1
5	T1	95	0.0	0.107	3.9	LOS A	0.5	3.8	0.17	0.48	0.17	46.7
6	R2	33	0.0	0.107	6.9	LOS A	0.5	3.8	0.17	0.48	0.17	46.5
Approach		137	0.0	0.107	4.6	LOS A	0.5	3.8	0.17	0.48	0.17	46.6
North: Mitchell Road												
7	L2	18	0.0	0.041	4.5	LOS A	0.2	1.4	0.25	0.52	0.25	45.8
8	T1	15	0.0	0.041	4.1	LOS A	0.2	1.4	0.25	0.52	0.25	46.4
9	R2	15	0.0	0.041	7.1	LOS A	0.2	1.4	0.25	0.52	0.25	46.2
Approach		47	0.0	0.041	5.2	LOS A	0.2	1.4	0.25	0.52	0.25	46.1
West: Orchard Road												
10	L2	11	0.0	0.077	4.2	LOS A	0.4	2.6	0.18	0.47	0.18	46.2
11	T1	68	0.0	0.077	3.9	LOS A	0.4	2.6	0.18	0.47	0.18	46.8
12	R2	17	0.0	0.077	6.9	LOS A	0.4	2.6	0.18	0.47	0.18	46.6
Approach		96	0.0	0.077	4.5	LOS A	0.4	2.6	0.18	0.47	0.18	46.7
All Vehicles		314	0.0	0.107	4.7	LOS A	0.5	3.8	0.20	0.49	0.20	46.5

Table B3: Saturday Roundabout Intersection Performance of Mitchell Road with Orchard Road PM Peak Hour with Showroom and Tasting Area Trips

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Wattle Road												
5	T1	65	0.0	0.042	0.1	LOS A	0.1	0.6	0.10	0.09	0.10	49.2
6	R2	13	0.0	0.042	5.0	LOS A	0.1	0.6	0.10	0.09	0.10	48.3
Approach		78	0.0	0.042	0.9	NA	0.1	0.6	0.10	0.09	0.10	49.1
North: Mitchell Road												
7	L2	23	0.0	0.021	4.9	LOS A	0.1	0.5	0.23	0.51	0.23	46.1
9	R2	5	0.0	0.021	5.3	LOS A	0.1	0.5	0.23	0.51	0.23	45.7
Approach		28	0.0	0.021	5.0	LOS A	0.1	0.5	0.23	0.51	0.23	46.0
West: Wattle Road												
10	L2	23	0.0	0.083	4.6	LOS A	0.0	0.0	0.00	0.08	0.00	49.1
11	T1	137	0.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	49.5
Approach		160	0.0	0.083	0.7	NA	0.0	0.0	0.00	0.08	0.00	49.5
All Vehicles		266	0.0	0.083	1.2	NA	0.1	0.6	0.05	0.13	0.05	49.0

Table B4: Saturday Priority Intersection Performance of Mitchell Road with Wattle Road PM Peak Hour with Showroom and Tasting Area Trips